III. REMARKS

In the Final Office Action, objection was made to claims 1, 8, 12 and 15 because of an alleged difference between the claimed subject matter and the teaching of the specification and the drawing.

Claims 1, 8, 12 and 15 were rejected under 35 U.S.C. 102 as being anticipated by Chong (US 6,590,946), and claims 10, 11, 14, 16 and 18 were rejected under 35 U.S.C. 103 as being unpatentable over Chong for reasons set forth in the Office Action. Other ones of the claims were rejected under 35 U.S.C. 103 as being unpatentable over various combinations of the cited art, namely, claims 2, 3, 9, 13 and 17 over Chong in view of Manjunath (US 6,456,964), claims 4-5 over Chong in view of Manjunath and Kleijn (US 6,223,151), claim 7 over Chong in view of Manjunath, Kleijn (US 6,223,151) and Kleijn (US 5,517,595), and claim 6 over Chong in view of Manjunath and Donovan (US 6,266,637) for reasons set forth in the Action.

The following argument (previously presented in the after-Final response) is presented to overcome the above-noted objections to the independent claims 1, 8, 12, and 15, and to overcome the foregoing grounds of rejection so as to present allowable subject matter in the independent claims as well as in their respective dependent claims.

The claim objections stated in page 2, paragraph 2 of the Detailed Action are traversed respectfully. The Examiner refers to the portion of the description where TD-PSOLA normalization is performed on the original speech signal. Claim 1, as well as other ones of the independent claims, call for a determining of an estimate of periodicity from the signal that has been formulated from the speech signal of a speaker. The estimate of the periodicity is then used in a subsequent step of modifying the aforementioned formulated signal. As set forth in claim 1, the step of modifying the formulated signal improves the equality of a spacing of the pitch pulses. Thereafter, the step of determining the voicing parameter is performed based on the modified signal having the improved periodicity of the pitch pulses.

As noted in the present specification, in the paragraph linking pages 9-10, it is taught that, instead of determining the voicing information from the original signal, the voicing information is determined from normalized speech from which pitch jitter is effectively removed. This is in accord with the foregoing recital of claim 1, wherein an estimate of periodicity is used to modify the signal formulated from the speech uttered by a speaker, and wherein, subsequently, the modified signal is used for determining the voicing parameter. This was noted also by the examiner in the reference in the specification to page 12, lines 15-16; thus the voicing parameter decision is made based on the normalized signal. This is a feature in the invention that is called for by present claim 1, and shows that the recital of claim 1 is in agreement with the teaching of the specification. Accordingly, the objection should not have been raised by the examiner. A corresponding analysis applies to the other independent claims. Therefore, this analysis is believed to overcome the objection raised in Point 2 of the Action.

With respect to the rejections based on 35 U.S.C. 102 and 103, it is noted that Chong discloses a method for shifting peak instants of a digitized speech signal in the time domain. As depicted in Figures 1 and 2 of Chong, pitch pulses are detected from analysis frame data taken from an input sequence. Voicing data is classified from the input sequence as well, and a preliminary estimate of the signal period is calculated in a functional block performing "pitch and voicing analysis".

The voicing information as well as the locations of the pulses, prior to a shifting of the pulses, are directed to a block performing "mapping optimization". This block performs the transformation from the unshifted time-scale into the shifted (or "warped") time-scale. New sampling instants are calculated in view of the mapping parameters, and shifted sample values are calculated as well by using also the original analysis frame data. Thus, shifted sample sequences with altered peak instants are achieved as an output signal.

It is emphasized that in Chong, the voicing parameter analysis is made to the signal before any modifications are performed to the signal. This is clearly seen in Figure 1 of Chong, where the voicing analysis results (block 103) are used in the warped sampling instant and sample value calculations (blocks 106, 107). Also in Chong, Figure 3 and its description clearly reveal that a signal segment is at first classified as voiced or unvoiced, and this affects the manner in which the warped peak instants are determined for the set of signal segments. To the contrary, the present invention performs the voiced/unvoiced decision after the signal is modified. This is clearly seen in page 9, lines 12-16 and page 9, line 30 - page 10, line 6 in the present specification.

The present invention, as set forth in the present claims, teaches one to modify the signal spoken by the speaker to obtain improved periodicity so that the voiced/unvoiced decision can be made more reliably and, thereafter, one is to perform the signal encoding with the most reasonable method according to the voicing parameter result. In other words, a purpose of the present invention is to improve the reliability of the V/UV decision for a speech signal. In contrast, the purpose of Chong is to change the pitch period to an approximately fixed value for improving the performance of e.g. speech signal compression or transmission over a digital communication channel.

Furthermore, it seems that any decision-making of an encoding method among several different methods is not mentioned in Chong. Thus, Chong is further distinguished from the presently claimed subject matter because of a difference in an order of the performed method steps in the teachings of the present invention and in the teachings of Chong; the respective procedures are very different from each other.

With respect to those claims rejected based on a combination of the teachings of Chong combined with the teachings of other ones of the cited references, it is noted that the inclusion of the teachings of the other cited references does not alter the foregoing argument. Also, for reasons set forth in the remarks of the previous response, it is noted that these other references, such as Manjunath, and Kleijn '151, provide

teachings that differ from the practice of the present invention so that there would be no motivation to combine these references with Chong.

These matters were discussed with the examiner in an interview conducted by telephone on March 8, 2007 between David Warren and examiner Vo. The examiner opined that the order of the steps in the claim was not too significant because of a lack of statement of purpose showing how a method step related to the performance of a subsequent method step. The examiner acknowledged that the main reference, Chong, does not teach the encoding step at the end of present claim 1. The examiner also stated that the recital in the step:

> "modifying the formulated signal using the periodicity estimate such that the pitch pulses are spaced substantially equally along a time axis and thus, changing pitch periods of the formulated signal and improving periodicity"

is not significantly different from the corresponding teaching in Chong. It is appears that, possibly, the recital in this paragraph of claim 1 is regarded by the examiner as being sufficiently general so as to cover the operation of Chong.

It was noted at the interview that Chong does not disclose the subsequent encoding process called for by the present claims.

The examiner stated that claim 1 could be made to be allowable by adding more descriptive material to the claimed step:

> "determining at least one voicing parameter based on the modified signal, the voicing parameter being either voiced or unvoiced"

wherein the descriptive material would state a reason or purpose for performing this step. The addition of the descriptive material would relate the method steps to the function of encoding the modified speech signal, and thereby distinguish over Chong.

It is believed that the present amendatory language, "to enable a selection of encoding mode" (repeated below) with respect to the step of determining the voicing parameter, would meet the examiner's requirement for patentability:

> "determining at least one voicing parameter based on the modified signal, the voicing parameter being either voiced or unvoiced, to enable a selection of encoding mode;"

The foregoing discussion of the subject matter of claim 1 at the interview applies also to the corresponding subject matter of the other independent claims. Accordingly, corresponding amendatory language is placed in the other independent claims.

In particular, it is noted that this amendment points out a relationship between the inventive feature of determining a voicing parameter and the step of encoding the modified signal in a speech encoder. The amendment points out the relationship by stating that the determining of a voicing parameter is to enable a selection of encoding mode. This relationship is not suggested by Chong considered alone or in combination with the other cited references.

The claims, as amended, are believed to be distinguishable also over the two references Li et al. (Li) and WO99/10719 being submitted in an Information Disclosure Statement (IDS) , in view of the following observations.

Li discloses a speech codec that has a multimode functionality. With reference to Fig. 3, there is a first linear prediction coding which is done for obtaining a residual signal. Either the residual or the actual speech signal is directed to a pitch estimation module. This block first classifies the input speech into two different categories of speech, the first category including unvoiced speech and silence, and the second category including voiced speech and transition speech. Pitch candidates are generated by autocorrelation. The second category of speech is further classified and the final speech is determined based on the pitch candidates. The signal is also modified based on the residual signal.

Finally, the pitch is further refined and harmonic bandwidth is estimated. The signal modification is formed similarly as disclosed in a further referred document [9] "TIA/EIA/IS-127, Enhanced Variable Rate Coded (EVRC), TIA Draft Standard, 1996". The EVRC uses a generalized Code-Excited Linear Prediction algorithm, which further matches a time-warped version of the original residual signal that conforms to a simplified pitch contour. In other words, the EVRC modifies the residual signal by shifting the shift pulses for matching a target residual signal (see document "Enhanced Variable Rate Codec, Speech Service Option 3 for Wideband Spread Spectrum Digital Systems, by 3rd Generation Partnership Project 2, April 2004", pages 4-1, 4-2 and 4-36. . . 44. Furthermore, the EVRC basically does some preprocessing as high-pass and adaptive noise suppression filtering. As mentioned on page 1359, chapter 5, lines 6-13 of Li, the encoding mode appears to be set according to the voice classification. The signal modification (pitch shifting) in the present invention appears to follow a different principle than that of Li.

WO99/10719 discloses a speech encoding method called hybrid coding. The method includes linear prediction analysis and obtaining a residual signal by linear LP filtering. Class (voiced, unvoiced, and "mixed" speech) and pitch are determined and the bandwidth, where the speech segment is harmonic, is determined. Then different colors are taken into use for different classes of speech, a harmonic coder for voiced speech, a noise-like coder for unvoiced speech, and a coder for transition speech. Finally, synchronization between different coders is accomplished. In Figures 10-12, a signal modification functionality is used. Signal modification is made by so-called time-warping for matching a certain reference signal. The time-warping is performed as disclosed in a referred document US patent 5, 704,003 (Kliejn; RCELP Coder). As is explained in Col. 2, at line 58 to col. 3 at line 5 in pat. 5, 704,003, segments including a pulse are shifted in time, where the segment boundaries are located far from the pulses.

The principles of the present invention, as set forth in the subject matter of the present claims, with respect to the signal modification feature, and the enabling of a selection

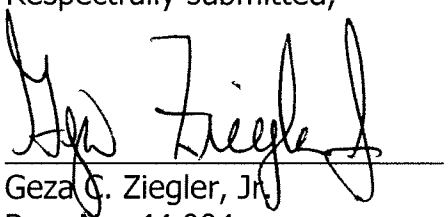
of an encoding mode are distinguished clearly from Chong and the other references cited in the Final Rejection, as well as from the foregoing two references of the IDS.

Therefore, in view of the foregoing argument, it is urged that the rejections have been overcome to provide allowable subject matter.

For all of the foregoing reasons, it is respectfully submitted that all of the claims now present in the application are clearly novel and patentable over the prior art of record, and are in proper form for allowance. Accordingly, favorable reconsideration and allowance is respectfully requested. Should any unresolved issues remain, the Examiner is invited to call Applicants' attorney at the telephone number indicated below.

The Commissioner is hereby authorized to charge payment for the RCE fee ($790) and a three-month extension of time as well as any other fees associated with this communication or credit any over payment to Deposit Account No. 16-1350.

Respectfully submitted,



14 May 2007
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